

CLEAN COPY OF ALL PENDING CLAIMS

58. An electroactive assembly, comprising

a flexible circuit including a stiff non-conductive polymer film and at least conductive leads, wherein the conductive lead is disposed on at least one surface of the stiff non-conductive polymer film;

at least one cylindrical electroactive element having a length and a diameter;

a polymer bonding material disposed between said stiff nonconductive polymer film and said at least one cylindrical electroactive element,

wherein said conductive lead contacts said cylindrical electroactive element for at least a portion of the length of the cylindrical electroactive element, thereby establishing direct electrical contact with the cylindrical electroactive element, such that planar strain in said cylindrical electroactive element is effectively shear coupled through the polymer bonding material, and between said cylindrical electroactive element and said flexible circuit.

59. The electroactive assembly of claim 58, further comprising a control system in electrical communication with said flexible circuit.

60. The electroactive assembly of claim 59, wherein the control system comprises is either a microprocessor chip or a programmable logic device.

61. The electroactive assembly of claim 60, wherein the control system is programmed to recognize empirical conditions and to select special control laws that specify the gain and phase of a driving signal sent to the flexible circuit.

62. The electroactive assembly of claim 58, wherein the planar strain, coupled between the flexible circuit and the at least one cylindrical electroactive element, is one of in-plane strain and cross-plane strain.

63. The electroactive assembly of claim 58, wherein the polymer bonding material is a curable polymer.

64. The electroactive assembly of claim 58, wherein the at least one cylindrical electroactive element is a piezoceramic.

65. The electroactive assembly of claim 58, wherein stiff non-conductive polymer film has high dielectric strength, high shear strength, and water resistance.

66. The electroactive assembly of claim 58, wherein the diameter of the at least one cylindrical electroactive element is between 0.025 millimeters and 0.050 millimeters.

67. A method of controlling the vibration of a structure using an electroactive assembly, the electroactive assembly including

a flexible circuit including a stiff non-conductive polymer film and a conductive lead, wherein the conductive lead is disposed on at least one surface of the stiff non-conductive polymer film;

at least one cylindrical electroactive element having a length and a diameter;

a polymer bonding material disposed between said stiff nonconductive polymer film and said at least one cylindrical electroactive element,

wherein said conductive lead contacts said cylindrical electroactive element for at least a portion of the length of the cylindrical electroactive element, thereby establishing direct electrical contact with the cylindrical electroactive element, such that planar strain in said cylindrical electroactive element is effectively shear coupled through the polymer bonding material, and between said cylindrical electroactive element and said flexible circuit,

comprising the steps of:

incorporating the electroactive assembly into the structure;

using the electroactive assembly to sense vibratory motion within the structure by transducing vibration in the structure into electrical energy; and

transducing the electrical energy through the electroactive assembly causing at the least one electroactive element to change dimension, thereby reducing vibration in the structure.

68. A method of controlling the vibration of a structure using an electroactive assembly according to claim 59, comprising the steps of:

incorporating the electroactive assembly into the structure;

using the electroactive assembly to sense vibratory motion within the structure by transducing vibration in the structure into electrical energy;

sending the transduced electrical energy to the control system, and

actuating the electroactive assembly in accordance with signals received by the flexible circuit from the control system, thereby reducing vibration in the structure.